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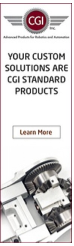
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How construction companies can save money, boost revenue with robots and AI

By Zena Ryder | October 25, 2020

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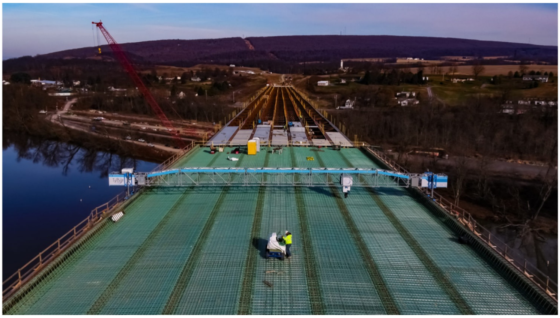

TyBot in the Central Susquehanna Valley Transportation River Bridge project. Source: Advanced Construction Robotics Inc.

According to McKinsey, the construction industry is one of the largest sectors of the global economy. About $10 trillion is spent every year on construction-related goods and services. However, productivity in the U.S. construction industry has barely changed since 1945.

In comparison, productivity has grown by as much as 1,500% in **manufacturing**, **retail**, and **agriculture**. That presents an opportunity for robotics.

Unlike stable factory environments, construction sites change every day. "Construction environments are difficult for robot perception and navigation because they're full of obstacles, including staged materials and moving people and equipment," said Brian Ringley, construction technology manager at **Boston Dynamics**.

Not only that, as the building is constructed, the entire environment changes. Advances in artificial intelligence increase the scope for robotics in these chaotic, dynamic environments, and **construction robotics** are starting to show up on more **job sites**.

Spot reduces time on construction tasks

Starting in January, Boston Dynamics' **Spot** quadruped robot trotted around a **Pomerleau** construction site in Montreal, taking 360-degree progress photos from specific on-site locations.

After a six-month trial, the company extended its lease to continue using Spot. Pomerleau's team found value in using the robot, Isaac Charbonneau Beaulieu, innovation manager, told ***The Robot Report***. Before Spot took on the task, someone walked around manually taking photos so clients could stay up to date on construction progress without having to visit the site.

"The tedious task of taking all these photos is not a good use of an employee's or an intern's time," said Charbonneau Beaulieu. Now, those employees can do the more interesting and higher-value task of analyzing the photo data to see how it matches up with the computer models of the building design, he said.

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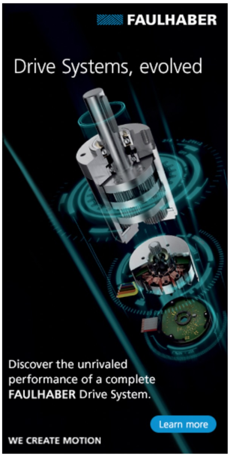
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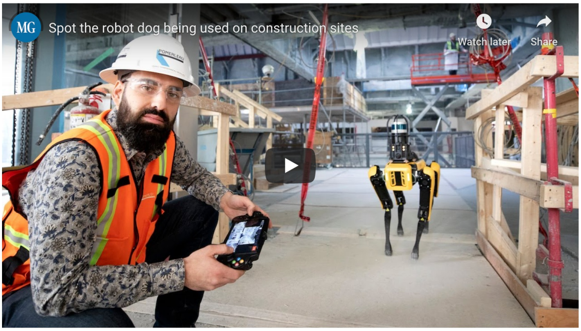
If a data analyst sees a potential conflict — such as, an air-conditioning duct that appears to be installed where it might interfere with the plumbing system that's due to be installed the following week — he or she can flag it for further review.

"We're saving much more than the 20 hours a week it takes a person to take all those photos," said Charbonneau Beaulieu. "By preventing and catching mistakes or conflicts, we can save a ton of time, hassle, and money."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TyBot designed to prevent injuries, increase profit

TyBot is another robot using AI on construction sites. "Robots can replace repetitive, injury-prone work that humans hate — and also make construction more efficient," said Jeremy Searock, president of Pittsburgh-based **TyBot LLC**.

One of those tasks is tying bridge deck rebar, the steel that's laid in crisscross rods before concrete is poured over it to create the bridge surface. Typically, the rods are manually tied together where they intersect: laborers bend over again and again and use a special tool to tie the intersections at their feet. A bridge can have thousands of intersections to tie before the concrete is poured.

Because of the variations between intersections, automation isn't possible. "TyBot isn't doing a repetitive, automated motion over and over," explained Searock. "It can *see* the rebar and adjust to slight differences from one intersection to the next."

TyBot can complete about 1,000 ties an hour. It would take ten humans to tie that fast, and the robot does it without stopping for breaks, hour after hour.

Shelby Erectors, which specializes in installing bridge rebar, has been using TyBot on some jobs. Not only is the robot reducing the risk of injury and fatigue, but it is also making their job sites more efficient.

"I can now complete more bridge jobs in a year with the same number of employees," said Jack Nix, vice president of operations at Shelby. Even factoring in the cost of leasing the robot, this results in greater annual profit, he said.

TyBot Operational Overview
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TyBot

Drones can reduce costs, collect data, avoid construction conflicts

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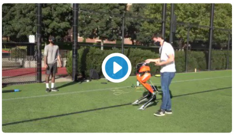

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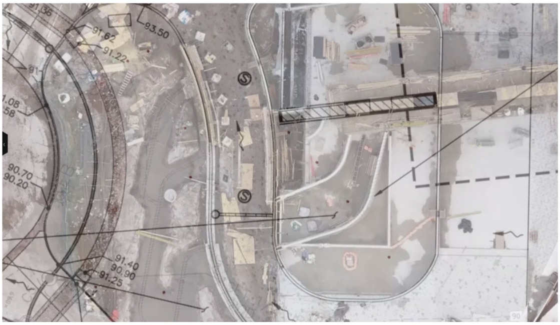
Another rebar-tying robot is **SkyMul**'s **drone**, the SkyTy, which is currently still in development and anticipated for commercial deployment in 2021. One drone flies over the rebar to map it, and then a swarm of drones ties it.

Contractors are sometimes forced to pause jobs because of a lack of labor, explained, explained Eohan George, co-founder and CEO of SkyMul. "We can reduce the time it takes to tie rebar by about 60%, while using 50% to 80% less labor," he said.

Because the drones can tie rebar faster than humans, each project takes less time to complete. "Every day a site is open costs money — renting equipment, site security, and so on," said George. "Reducing the time a site is open saves money for the contractor."



A curved wall with PDF overlay. Source: PCL

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Drones are already being used for other tasks on construction sites. "On social media, people love drone video footage showing project progress," said Sean Anderson, president and CEO of **Stoer Construction**. "It takes time to see the financial benefit of any kind of marketing, but those posts certainly get attention."

The company also shares progress photos with clients. "Some clients expect progress photos these days, as do banks," Anderson said. "We could walk around and take photos, but drone photos are obviously more useful for giving the overall, big picture of project progress."

PCL Construction also uses drones for marketing and progress photos, but they also use them to ensure projects are on track. The drone flies autonomously, and ArcGIS's **Site Scan software** creates 3D models, which are overlaid onto design models using **AI Clearing's** AI engine.

"The AI can identify if a particular concrete column has been installed and automatically compares the photo data to the design data to make sure it's within tolerance," said André Tousignant, virtual construction manager at PCL Construction.

"We've always compared our site work to the design data," Tousignant said. "But the drones mean we can do it in a fifth of the time."

A site scan with UG plumbing overlay. Source: PCL

Tousignant described an example of a concrete slab foundation that might have hundreds of objects embedded it and openings for different parts of the structure.

“Traditionally, you’d use a tape measure to verify that all the objects and openings match the plans,” he said. “Now, the drone can fly that deck in 10 minutes, and we can have an overlay of that data onto the design data in less than an hour.”

Saving labor hours across PCL’s projects is not the only financial benefit for the company. “As a company, we track any rework we have to do.” said Tousignant. “Because drones help prevent problems, they drive rework costs down.”

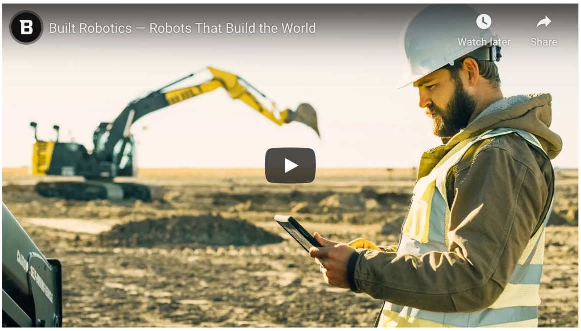
Earthmoving robots can reduce risks and increase revenue

Built Robotics upgrades ordinary earthmoving vehicles, such as excavators, into autonomous robots by adding AI guidance systems.

One goal is to improve safety. Excavation environments are unstable, and one cubic yard of dirt weighs one or two tons or more — enough to cause serious harm or death if it falls on someone working near dirt walls or piles.

“Of all the machinery and equipment used on construction sites, excavators are responsible for the greatest number of fatal accidents,” according to a 2019 **article** in the journal *Sensors*.

“It’s important to keep people out of harm’s way and have technology like robots to handle more dangerous tasks,” said Erol Ahmed, director of communications at Built Robotics.



In addition to improving site safety, Built Robotics’ clients benefit from increased productivity because, as Ahmed explained, “a single operator can supervise an entire fleet of equipment, instead of being tied to just one machine.”

The machines can work autonomously 24 hours a day, accomplishing more with the same amount of equipment. Shrinking project timelines saves money on each project. “Completing projects and starting new ones more quickly increases overall revenue,” Ahmed added.

By increasing productivity, safety, and insight into projects, robots, drones, and AI have the potential to make a big impact in the construction **industry**, helping the world meet its housing and infrastructure needs in the future.

About the author

Zena Ryder is a freelance writer based in Canada. She specializes in writing about robotics and construction — not usually at the same time! — for magazines, websites, and businesses. She can be reached at **her website** or on **LinkedIn**.

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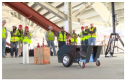

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